



ORIGINAL ARTICLE

Navigated versus conventional total knee arthroplasty: A prospective study at three years follow-up[☆]

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KEYWORDS
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Abstract

Objective: Computer-assisted surgery application in total knee arthroplasty (TKA) has shown more accurate implant alignment compared with conventional instrumentation and is associated with more homogeneous alignment results. Although longer implant survival and superior clinical outcomes should be expected from navigated TKA, currently available evidence does not support this hypothesis. The aim of this study was to compare navigated TKA with conventional TKA regarding clinical and radiological outcomes after a 3-year follow-up under the hypothesis that navigated TKA would provide better outcomes than conventional TKA.

Material and method: In a prospective multicentre study, 119 patients underwent navigated TKA and 80 patients received conventional instrumentation. Patients were evaluated at the baseline and at postoperative months 3, 12, 24, and 36. Analysis included the American Knee Society Score (KSS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), Short Form-12 (SF12) Health Survey, and radiographic assessment.

Results: All clinical scores improved significantly for all patients during the follow-up but were significantly better in the navigation group.

The percentage of patients showing a mechanical axis between 3° of varus and 3° of valgus was significantly higher in the ATR group (93%) than in the conventional TKA group (71%) ($p < .01$).

Conclusions: The use of computer-assisted surgery in TKA provides more accurate mechanical alignment and superior short-term functional outcomes compared to conventional TKA.

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PALABRAS CLAVE

Artroplastia total de rodilla;
Cirugía asistida por ordenador;
Navegación;
Resultados clínicos

Artroplastia total de rodilla navegada versus convencional; estudio prospectivo a 3 años de seguimiento**Resumen**

Objetivo: La navegación en la artroplastia total de rodilla (ATR) ha demostrado obtener una alineación de implantes más precisa comparada con la instrumentación convencional. Aunque se debería esperar una supervivencia más prolongada de los implantes y resultados clínicos superiores mediante la cirugía navegada, la evidencia disponible no apoya esta hipótesis. El objetivo de este estudio fue comparar los resultados clínicos y radiológicos de la ATR navegada con la ATR convencional tras un seguimiento de 3 años bajo la hipótesis de que la navegación proporcionaría mejores resultados.

Material y método: Estudio prospectivo multicéntrico de 119 pacientes intervenidos de ATR navegada y 80 pacientes con instrumentación convencional. Todos ellos fueron evaluados preoperatoriamente, a los 3, 12, 24 y 36 meses. El análisis incluyó los cuestionarios *Western Ontario and McMaster's Universities Osteoarthritis Index* (WOMAC), *Knee Society Score* (KSS) y *Short Form-12 Health Survey* (SF-12), además de la evaluación radiográfica.

Resultados: Todas las puntuaciones clínicas mejoraron para todos los pacientes durante el seguimiento, pero fueron significativamente mejores en el grupo de navegación.

El porcentaje de pacientes que mostraban un ángulo mecánico femorotibial comprendido entre 3° de varo y 3° de valgo fue significativamente mayor en el grupo de ATR navegada (93%) que en el grupo de ATR convencional (71%) ($p < 0,01$).

Conclusiones: El uso de la cirugía asistida por ordenador en la ATR proporciona una alineación mecánica más precisa y resultados funcionales superiores a corto plazo en comparación con la cirugía convencional.

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Introduction

Achieving good long-term clinical and functional outcomes after total knee arthroscopy (TKA) depends on various factors; in particular the correct alignment of the implant and appropriate balance of the soft tissue. Imageless computer-assisted surgery (CAS) was introduced in the nineteen nineties as a navigation method to help surgeons plan and perform surgical procedures with more precision without using computerised tomography imaging. A CAS system uses infrared communication to spatially locate the patient's limb and, by calculations performed by the computer, enables the surgeon to plan bone cuts before making them, check them when made and assess the postoperative alignment of the implant components. The purpose of using CAS in TKA is to achieve a standardised technique for more precise positioning and alignment of implants compared to the use of conventional instruments.¹ Navigation has shown more homogeneous outcomes in alignment on the sagittal plane with a greater number of implants placed between 3° of varus and 3° of valgus compared to conventional TKA.²⁻⁴ However, their efficacy in achieving better sagittal alignment remains controversial.^{3,4} CAS also enables appropriate balancing of the ligaments and of the flexion and extension gaps using the space balancing technique and sequential soft tissue release.⁵ Although in theory that could result in longer duration of the implant and better clinical outcomes, the current evidence does not corroborate this hypothesis. A meta-analysis series on implant alignment²⁻¹² concluded that navigation promotes better outcomes. In

terms of clinical outcomes, however, there have been controversial reports in the literature, mainly due to the great variety and heterogeneity of questionnaires and measurements used in the studies gathered.⁷⁻¹⁰ In 2014, Rebal et al.¹¹ published the first meta-analysis that included 21 studies with a level of evidence I, demonstrating that the use of navigation in TKA achieves better alignment of the mechanical axis and improved short and medium term functional outcomes, analysing the Knee Society Score (KSS) questionnaire exclusively.

The aim of this study was to compare, after 3-years' follow-up, the clinical and radiological outcomes of navigated knee arthroscopies with those of prostheses implanted using the conventional technique, with the hypothesis that navigation provides better outcomes.

Material and methods

Sample description

In a prospective multi-centre study performed in 3 hospitals, 199 patients were operated by 3 surgeons, one in each hospital, to implant a TKA. The inclusion criteria for both groups were primary or secondary gonarthrosis where conservative treatment had failed. One hospital used the conventional technique with posterior cruciate-retaining (CR) prostheses in 80 patients, another used navigation and CR prostheses in 29 patients and navigation and posterior-stabilised (PS) prostheses in 41 patients, and the third (49 patients) used

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